

Date: Thursday, 26/02/2009 11:41:29 AM  
 User: Julie Dawson

## Process Sheet

Customer : CU-DAR001 Dart Helicopters Services Drawing Name : HIGH AFT X-TUBE 412  
 Job Number : 46093  
 Estimate Number : 10559  
 P.O. Number :  
 This Issue : 26/02/2009 S.O. No. :  
 Prsht Rev. : NC  
 First Issue : / / Type : CROSSTUBES  
 Previous Run : 46092  
 Part Number : D412664203  
 Drawing Number : D412-664-243 REV D  
 Project Number : N/A  
 Drawing Revision : D  
 Material :  
 Due Date : 18/03/2009 Qty: 1 Um: Each

Written By :  
 Checked & Approved By : JUD 09.02.06  
 Comment : Est Rev:E 04.02.16 Reformat; Added D3189-1 K/DS  
 Est Rev:F 06-03-29 Remove Coments on Pick List JLM  
 Est Rev:G 06.12.08 per ECN 886 EC  
 Est Rev:H 07-04-30 As per Rev D JLM  
 Est Rev:I 08-06-12 add comment in seq. 21 DD verified by:EC

## Additional Product

Job Number:



Seq. #: Machine Or Operation: Description :

1.0 DC DOCUMENT CONTROL



for JUD 09/03/16



Comment: DOCUMENT CONTROL

Photocopy bluefile and create labels as per PPP D412-664-203 CHG 006

S 09/03/16

2.0 PACKAGING 1 PACKAGING RESOURCE #1



Comment: PACKAGING RESOURCE #1

3.0 D412664203TRN Crosstube Turning Detail



Comment: Qty.: 1.0000 Each(s)/Unit Total : 1.0000 Each(s)

CROSSTUBE TURNING DETAIL

batch B-45871

MB

09-03-05

①

4.0 BENDING BENDING MACHINE - SKIDTUBES



MP

09-03-06



Comment: BENDING MACHINE

Bend tube as per Dwg D412-664-243 using CNC bender program 412-af and Folio FT010

5.0 QC15 DIMENSIONAL CHECK OF X-TUBES



09-03-05 ①



Comment: DIMENSIONAL CHECK OF X-TUBES

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

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Job Number: 46093

Part Number: D412664203

Job Number:



Seq. #:

Machine Or Operation:

Description :

6.0

CROSSTUBES

CROSSTUBES RESOURCE 1



Comment: LANDING GEAR RESOURCE 1

1-Drill pilot holes in tube as per Dwg D412-664-243 using drill Jig DT8550 & DT8551

2-Ream hole to finish size in tube as per Dwg D412-664-243 using drill Jig DT8550 & DT8551. Check dimensions between holes, both sides on both cuffs, to ensure alignment with saddle holes.

3-Deburr & Inspect for surface damage. Repair damage within limits as per Dwg D412-664-243

*PM 09-03-09*  
*AWM 9-3*

7.0

HAND FINISHING1

HAND FINISHING RESOURCE #1



Comment: HAND FINISHING RESOURCE #1

Chemical Conversion Coat as per QSI 005 4.1

*AWM 9-3-10*

8.0

QC3

INSPECT POWDER COAT/CHEMICAL CONVERSION



Comment: INSPECT POWDER COAT/CHEMICAL CONVERSION

*09-03-11 ①*

9.0

QC5

INSPECT WORK TO CURRENT STEP



Comment: INSPECT WORK TO CURRENT STEP

*09-03-11 ①*

10.0

OUTSIDE SERV.11

OUTSIDE SERVICE -CROSSTUBES



Comment: Sub-Contracting OUTSIDE SERVICES

Liquid Penetrant Inspection as per QSI 038Or

Issue P/O: *9322* LPI as per ASTM 1417

Level 2 Attach copy of NDT results to work order

*09/03/11 ①*

11.0

PACKAGING 1

PACKAGING RESOURCE #1



Comment: PACKAGING RESOURCE #1

Inspect for transit damage

Ensure copy of NDT results attached to work order.

*09/03/11 ①*

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

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Job Number: 46093

Part Number: D412664203

Job Number:



Seq. #:

Machine Or Operation:

Description :

12.0

QC5

INSPECT WORK TO CURRENT STEP



Comment: Inspect for damage & ensure results are as per Dwg D412-664-203

13.0

SPRAY PAINTING

SPRAY PAINTING



Comment: SPRAY PAINTING

1-Prime inside and outside crosstube as per QSI 005 4.2

2-Paint outside crosstube with White Imron as per QSI 005 4.2

PRIME:

Start Time: 7:00

Finish Time: 8:00

PAINT:

Start Time: 10:00

Finish Time: 11:00

14.0

QC14

INSPECT SPRAY PAINT



Comment: Inspect Spray Paint

Wrap in plastic bag to protect from scratches

15.0

D3595063570

RUBBER CUSHION



Comment: Qty.: 4.0000 Each(s)/Unit Total : 4.0000 Each(s)

Rubber Cushion

Batch: 42243

16.0

D2856600

Abrasion Strip



Comment: Qty.: 1.7640 f(s)/Unit Total : 1.7640 f(s)

Pick:

Qty Part number Description Batch

2 D2856-600(Cut to 10.090") Abrasion Strip

36398

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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Job Number: 46093

Part Number: D412664203

Job Number:



Seq. #:

Machine Or Operation:

Description :

17.0

D28961

Support



Comment: Qty.: 1.0000 Each(s)/Unit Total : 1.0000 Each(s)

Pick:

Qty Part number Description Batch

1 D2896-1

Support

35577

RT 09-03-17

18.0

D31891

Chafing Shield



Comment: Qty.: 2.0000 Each(s)/Unit Total : 2.0000 Each(s)

Pick:

Qty Part number Description Batch

2 D3189-1

Chafing Shield

41659

RT 09-03-17

19.0

MS2192028

Clamp(per MIL-DTL-8783C)



Comment: Qty.: 4.0000 Each(s)/Unit Total : 4.0000 Each(s)

Pick:

Qty Part number Description Batch

4 MS21920-28

Clamp

109182

RT 09-03-17

20.0

MS2192030

clamp(per MIL-DTL-8783C)



Comment: Qty.: 2.0000 Each(s)/Unit Total : 2.0000 Each(s)

clamp(per MIL-DTL-8783C)

batch: 107545

RT 09-03-17

21.0

CROSSTUBES

CROSSTUBES RESOURCE 1



Comment: LANDING GEAR RESOURCE 1

Assemble as per Dwg D412-664-203

1- Lightly scuff the bonded area using a 320 grit sand paper and clean the area with 41058 wash 'n' wipe

2-Install supports with magnobond as per QSI 015 Adhere for for 12 Hrs

A/R 6398 Magnobond

Batch: 109900

Expiry Date: 09-09-19

RT 09-03-17

3-Install clamps as per Dwg D212-664-203 using installaiton jig DT9024 with 0.010 thick brass shims on both chafing shield (D3189-1). Torque clamps to 80-100 in lb.

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

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Job Number: 46093

Part Number: D412664203

Job Number:



Seq. #:

Machine Or Operation:

Description :

22.0

QC5

INSPECT WORK TO CURRENT STEP



Comment: INSPECT WORK TO CURRENT STEP

*SS 09/03/18 KL*

23.0

PACKAGING 1

PACKAGING RESOURCE #1



Comment: PACKAGING RESOURCE #1

Pick Packing Kit

24.0

AN640A

Bolt



Comment: Qty.: 4.0000 Each(s)/Unit Total: 4.0000 Each(s)

Bolt

Batch: M110267

*SS 09/03/18 KL*

25.0

AN641A

Bolt



Comment: Qty.: 2.0000 Each(s)/Unit Total: 2.0000 Each(s)

Bolt

Batch: M109371

*SS 09/03/18 KL*

26.0

AN960JD616

Washer



Comment: Qty.: 18.0000 Each(s)/Unit Total: 18.0000 Each(s)

Washer

Batch: M110002

*SS 09/03/18 KL*

27.0

MS21042L6

Nut



Comment: Qty.: 6.0000 Each(s)/Unit Total: 6.0000 Each(s)

Nut

Batch: M100185

*SS 09/03/18 KL*

28.0

QC4

INSPECT 100% KITS FOR COMPLETENESS



Comment: INSPECT 100% KITS FOR COMPLETENESS

*SS 09/03/18 KL*

29.0

PACKAGING 1

PACKAGING RESOURCE #1



Comment: PACKAGING RESOURCE #1

Identify and pack for shipping as per PPP D412-664-203

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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Job Number: 46093

Part Number: D412664203

Job Number:



Seq. #:

Machine Or Operation:

Description :

\*\*\*\*\*Ensure tube is not packaged if curing time is less than 12 hrs, see step 27 for application time & date  
\*\*\*\*\*

Time & date of packaging: 09/03/19 @ 2:00pm

Location: H

PPP Rev: H

FINAL INSPECTION/W/O RELEASE

30.0

QC21



09/03/19 H

Comment: FINAL INSPECTION/W/O RELEASE

Job Completion



U 09.03.19

D 412 664 203 B 46093

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

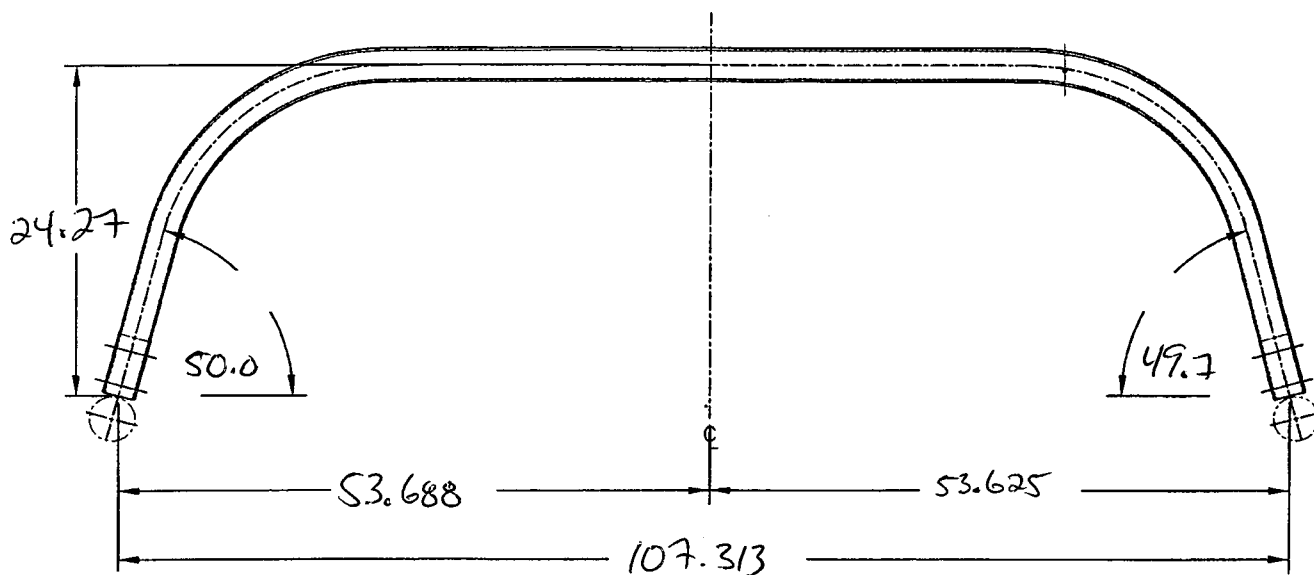
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			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

<b>DART AEROSPACE LTD</b>		<b>Work Order:</b> <i>H6093</i>	
<b>Description:</b> Crosstube High Aft (412)		<b>Part Number:</b> D412-664-203	
<b>Inspection Dwg:</b> D412-664-243		<b>Rev:</b> D	<b>Page 1 of 1</b>

Required Dimension	Min	Max
Height	24.24	24.50
1/2 Span	53.59	53.85
Angle	49	52
Total Span	107.18	107.70



Comments

QC15 Inspection	<i>[Signature]</i>
Date	

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	<i>[Signature]</i>
B	07.05.08	Dimensions updated per Dwg rev. D	KJ/JLM	

**DART**

DESIGN <b>PH</b>	DRAWN BY <b>PH</b>	<b>DART AEROSPACE LTD</b> HAWKESBURY, ONTARIO, CANADA	
CHECKED <b>QP</b>	APPROVED <b>[Signature]</b>	DRAWING NO. D412-664-243	REV. D SHEET 1 OF 3
DATE 07.03.09		TITLE CROSSTUBE ASSEMBLY (412 HI AFT)	SCALE NTS
A	01.10.17	NEW ISSUE	
B	05.02.04	ADD HOLES FOR COMPATABILITY WITH BHT/AA SKIDTUBES	
C	06.10.27	REMOVE D2856-600-1087, ADD D2732-058 & MAGNOBOND 6398 MS21920-32 WAS MS21920-30	
D	07.03.09	REMOVE D2732-058, CHANGE TO D3595-063-570	

**RELEASED**07.04.24 **[Signature]**

Qty	Part Number	Description
X	D412-664-243	CROSSTUBE ASSEMBLY (412 HIGH AFT)
1	D6009-129	CROSSTUBE
2	D3595-063-570	RUBBER CUSHION
1	D2896-1	SUPPORT
2	D2856-600-1009	ABRASION STRIP
4	MS21920-28	CLAMP
2	MS21920-30	CLAMP (OR MS21920-32)
2	D3189-1	CHAFING SHIELD
A/R	MAGNOBOND 6398	ROCKWELL SPECIFICATION RBO-120-023 ADHESIVE (TEXTRON/BELL SPEC. 299-947-100, TYPE II, CLASS 2 ADHESIVE)

**GENERAL NOTES:**

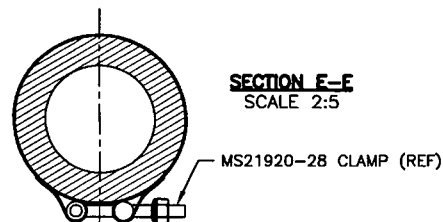
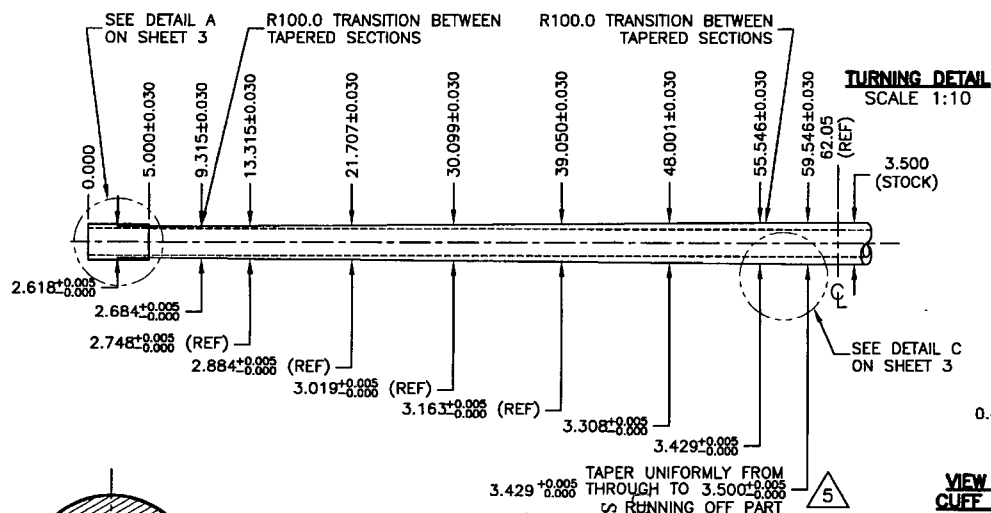
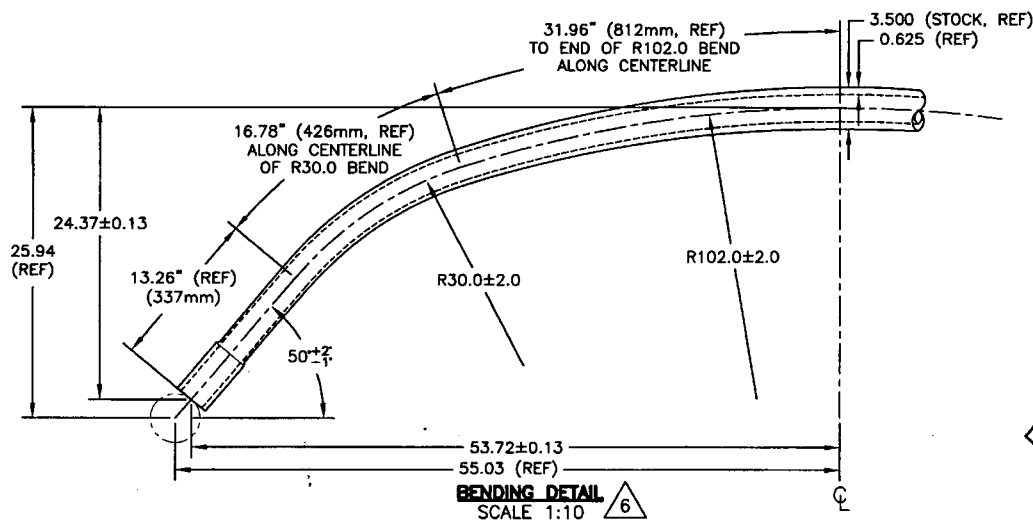
- 1) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 2) MATERIAL: MANUFACTURED FROM D6009-129  
FINISHED LENGTH = 124.09±0.020
- 3) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
PAINT OUTSIDE PER DART 005 4.2
- 4) PART IS SYMMETRIC ABOUT CENTERLINE.
- 5) RUN-OFF PART. BLEND OUT EDGE LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH.
- 6) BEND PROGRESSIVELY WITH A MINIMUM OF 8 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D.
- 7) LIQUID PENETRANT INSPECT OUTSIDE SURFACE OF CROSSTUBE PER QSI 038.
- 8) SCRIBE DART PART NUMBER AND BATCH NUMBER IN THIS AREA WITH VIBRATING STYLUS.
- 9) INSTALL D2856-600-1009 ABRASION STRIP WITH A 0.13 (REF) GAP ON BOTTOM SIDE OF CROSSTUBE PER QSI 035.
- 10) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE.
- 11) APPLY A 0.03" TO 0.06" THICK LAYER OF MAGNOBOND 6398 TO THE SURFACE OF D2896-1 THAT WILL BE IN CONTACT WITH THE CROSSTUBE PER QSI 015. LET CURE FOR 12 HOURS AFTER INSTALLATION AND PRIOR TO PACKAGING.
- 12) INSTALL MS21920-30 CLAMPS (OR -32) WITH D3595-063-570 RUBBER CUSHIONS TO SECURE D2896-1 SUPPORT ON TOP SIDE OF THE CROSSTUBE. ENSURE CLAMPS ARE OPPOSITE CROSSTUBE SUPPORT.
- 13) TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.

**SHOP COPY****RETURN TO****ENGINEERING****CONTROLLED COPY****SUBJECT TO AMENDMENT****WITHOUT NOTICE****WORK ORDER**

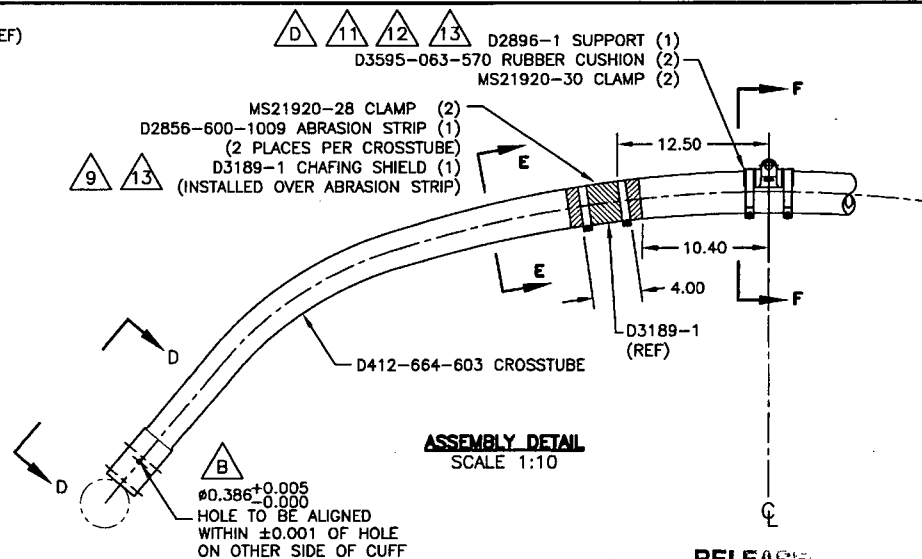
NO. 46093

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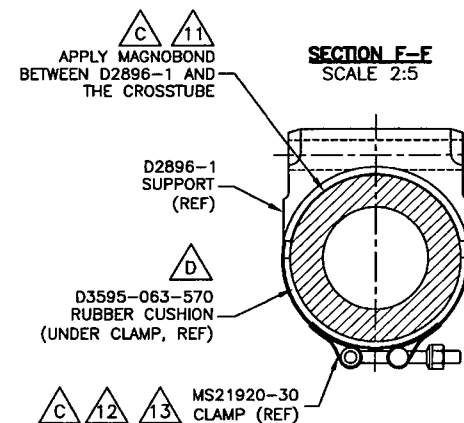
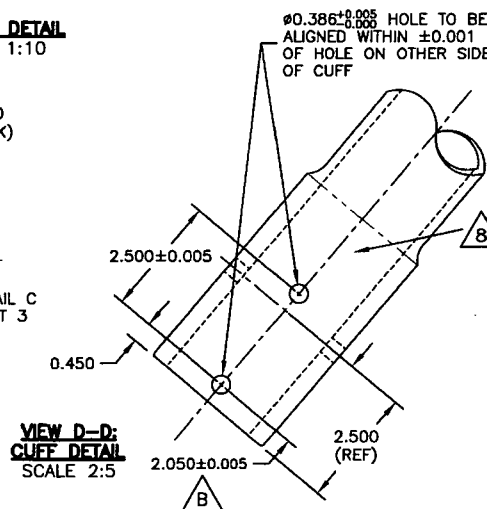
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WORK ORDER  
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RELEASE  
07 04 24



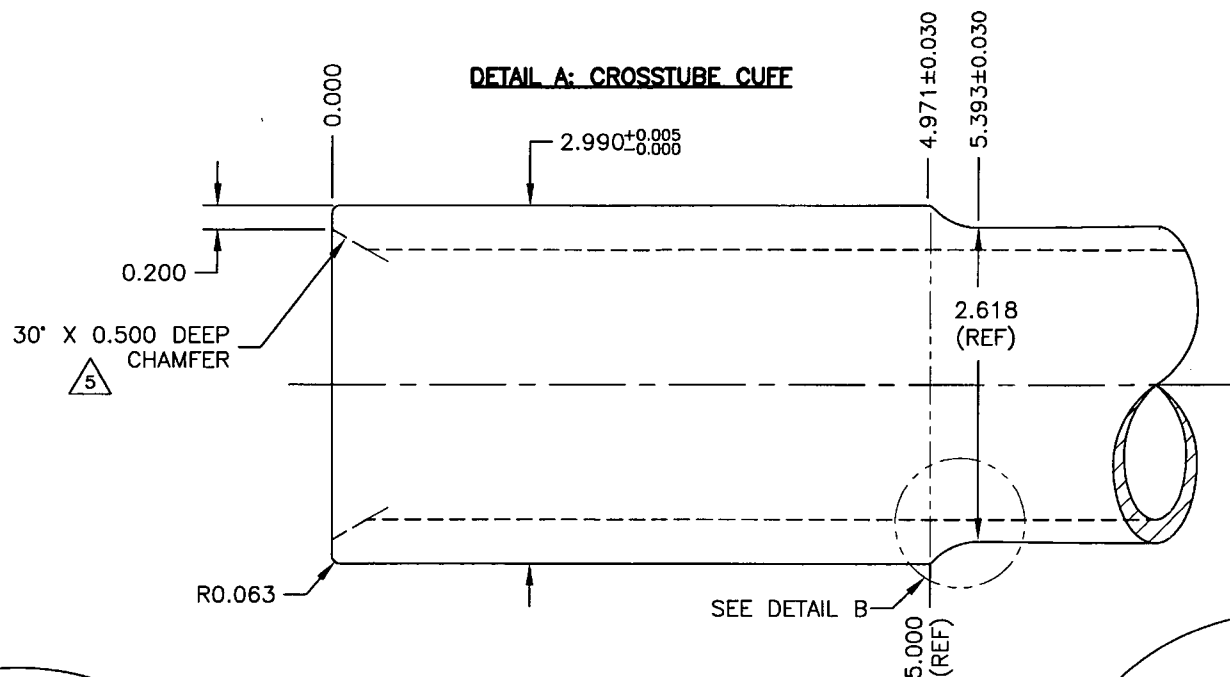
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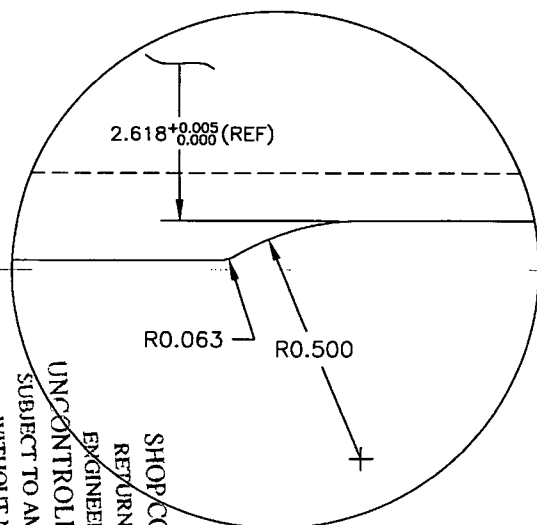
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CHECKED	GP	APPROVED	PH	DRAWING NO.	D412-664-243
DATE	07.03.09	TITLE	CROSSTUBE ASSEMBLY (412 HI AFT)	REV. D	SHEET 2 OF 3
		SCALE	1:10		

**RELEASED**  
07-04-2448  
REF ECN 089

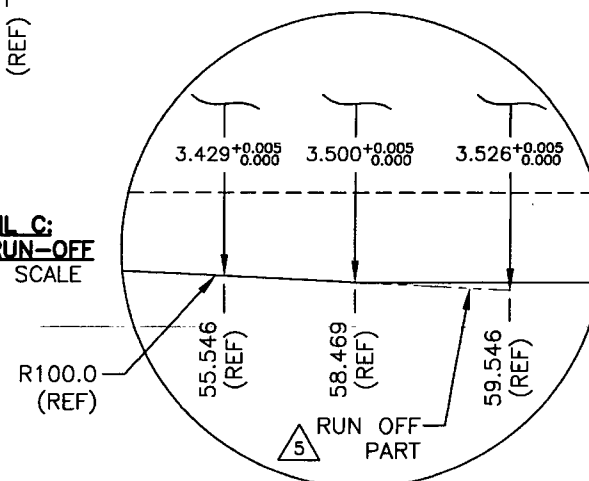
**DETAIL A: CROSSTUBE CUFF**



**DETAIL B: CUFF  
TRANSITION  
SCALE 4:1**



**DETAIL C:  
TAPER RUN-OFF  
NOT TO SCALE**



NO 14093  
WORK ORDER  
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SUBJECT TO AMENDMENT  
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		DATE	07.03.09			D412-664-243	SHEET 3 OF 3
						TITLE	SCALE
						CROSSTUBE ASSEMBLY (412 HI AFT)	1:1





## LIQUID PENETRANT TEST REPORT

P- 14935

PAGE 1 OF 1

CLIENT DART AEROSPACE DATE MAR 11-2007 TIME AM ☒ PM ☐  
ATTENTION LINDA / CHANTAL ACUREN JOB NO. 188-09-09 343  
ADDRESS 1270 ABOLDEEN ST PO/NO. 8382  
HAWKESBURY, ON WORK LOCATION HAWKESBURY / SHIP  
KOA 1K7 ACCEPTANCE STD. ASTM 1417 REV./DATE 2007  
PROJECT F.P.I. ON 100% EX TERNAL  
ITEM(S) EXAMINED FIVE CROSS TUBES -  
39 MACHINED PARTS - MOTOR MOUNTING

JOB DESCRIPTION PROCEDURE NO. LT-XXXX REV./DATE TECHNIQUE NO. LT-XXXX-XXX REV./DATE  
PART NO. MATERIAL THICKNESS  
SCOPE WET FLUORESCENT LIQUID PENETRANT INSPECTION  
ON 39 STAINLESS STEEL PARTS, 5 ALUMINE ALUMINUM X-TUBES

TEST DETAILS  
METHOD ☒ FLUORESCENT ☐ VISIBLE ☒ WATER WASH ☐ SOLVENT REMOVABLE ☐ POST EMULSIFIED  
FAMILY BRAND MAGNA FLUX BLACK LIGHT S/N 1165 ☒ OUTPUT > 1000  $\mu$ W/cm<sup>2</sup> ☐ AMBIENT < 2 fc  
PENETRANT ZL67 MINIMUM DWELL TIME 45 MIN. LIGHTING EQUIP. ☐ FLASHLIGHT ☐ TROUBLELIGHT ☐ OUTPUT > 100 fc @ SURFACE  
PENETRANT REMOVER H2O MINIMUM DRY TIME >10 MIN. OTHER LABINO  
DEVELOPER SKD 52 MINIMUM DWELL TIME 10 MIN. LIGHT METER S/N CAL DUE DATE FEB 2007  
DEVELOPER TYPE ☒ NON AQUEOUS ☐ AQUEOUS ☐ DRY

TEST SURFACE  
SURFACE CONDITION ☐ AS GROUND ☐ AS WELDED ☐ MACHINED ☐ SHOT BLASTED ☐ CLEAN BARE METAL  
SURFACE TEMPERATURE ☐ < -4°C/ 20°F ☐ -4°C/ 20°F TO 10°C/ 50°F ☐ 10°C/ 50°F TO 52°C/ 125°F ☐ > 52°C/ 125°F

RESULTS- (☐ METRIC ☐ IMPERIAL)

Q	JOB #	45671
10	#	45670
19	#	46051
11	#	46054
1	JOB #	46094
1	#	46092
1	#	46093
1	#	46371
1	#	46372

ALL ITEMS WERE FOUND ACCEPTABLE

Scope of Services  
The agreement of Acuren Group Inc. to perform services extends only to those services provided for in writing. Under no circumstances shall such services extend beyond the performance of the requested services. It is expressly understood that all descriptions, comments and expressions of opinion reflect the opinions or observations of Acuren Group Inc. based on information and assumptions supplied by the owner/operator and are not intended nor can they be construed as representations or warranties. Acuren Group Inc. is not assuming any responsibilities of the owner/operator and the owner/operator retains complete responsibility for the engineering, manufacture, repair and use decisions as a result of the data or other information provided by Acuren Group Inc. In no event shall Acuren Group Inc.'s liability in respect of the services referred to herein exceed the amount paid for such services.

Standard of Care  
In performing the services provided, Acuren Group Inc. uses the degree, care and skill ordinarily exercised under similar circumstances by others performing such services in the same or similar locality. No other warranty, expressed or implied, is made or intended by Acuren Group Inc.

## SIGNATURES

CLIENT REPRESENTATIVE Jan Titlay DTR # E-19816  
TECHNICIAN (SIGNATURE): Mike Titlay REPORT REVIEWED BY:  
NAME (PRINT): Mike Titlay NAME INITIALS  
CGSB LEVEL 1 SNT LEVEL 1 CGSB LEVEL 1 SNT LEVEL 1  
CGSB REG. No. 1 CGSB REG. No. 1